

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Boris Tsirlin	Examiner:	Le, Uyen Chau N
Serial No.:	10/707,895	Art Unit:	2876
Filed:	1/21/2004		
For:	Spatially Selective UHF Near Field Microstrip Coupler Device and RFID Systems Using Device		
Docket Number:	3042		
Confirmation No.:	1894		

37 CFR 1.132 AFFIDAVIT

Commissioner of Patents
P.O. Box 1450
Alexandria, VA 22313-1450

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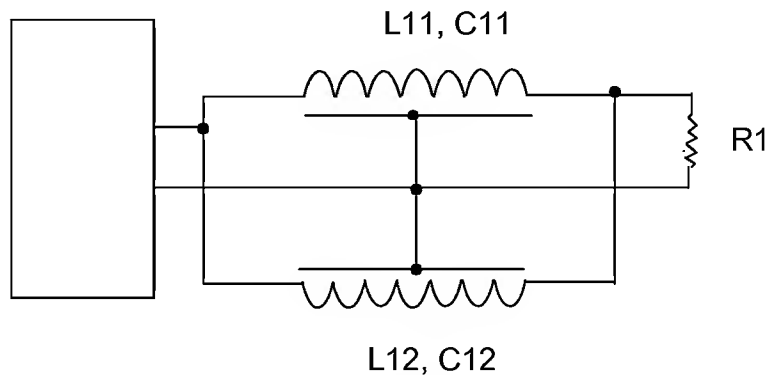
Sir:

This affidavit is filed in support of the above referenced patent application.

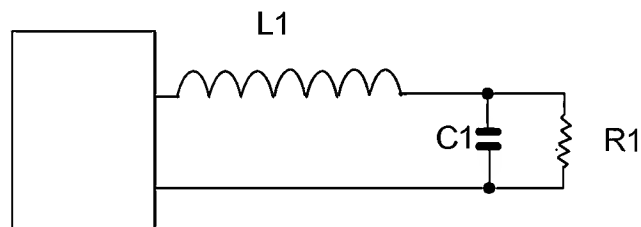
The undersigned affiant, Boris Tsirlin, hereby deposes and says:

1. I am over the age of eighteen, suffer no legal disabilities, have personal knowledge of the facts set forth below, and am competent to testify.
2. I am employed as a Senior Research Engineer by Zebra Technologies Corporation. As part of my job responsibilities, I design couplers for use with RFID transceivers and or transponders. I have worked with Zebra Technologies Corporation for 7.5 years.
3. I am one of the inventors of the above referenced patent application No. 10/707,895.
4. I have reviewed the references cited by the Examiner in the Official Action dated May 16, 2006 for the above referenced patent application. Specifically, US Patent No. 7,023,391 "*Wuidart*", US Patent No. 6,409,401 "*Petteruti*" and US Patent No. 5,294,931.
5. *Wuidart* does not describe or show in any figure an equivalent circuit to a near field coupler according to the invention.

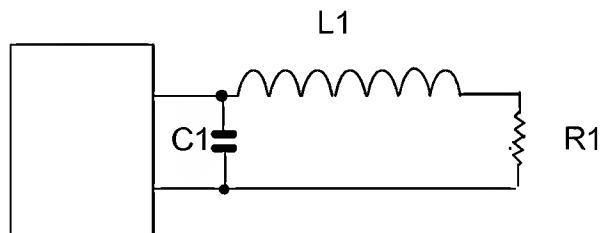
6. According to the present invention, the use of one or more microstrip lines over a ground plane creates the following radio frequency electrical circuit, shown here for demonstration purposes with only two parallel lines:



Here the capacitance C11 is distributed across the inductance L11 and similarly C12 over L12. For comparison with *Wuidart*, a simplified equivalent electrical circuit would be either of:



or



Neither of these circuit configurations are disclosed or suggested by *Wuidart*.

7. The radio frequency spectrum has been divided between the following ranges for ease of categorizing circuits / apparatus designed for a specific operating frequency and or frequency bands.

High Frequency (HF)	3-30 MHz
Very High Frequency (VHF)	30-300 MHz
Ultra High Frequency (UHF)	300-3000 MHz
Super High Frequency (SHF)	3000-30000 MHz

8. *Wuidart* is specifically disclosed as operable at 13.56 MHz, within the High Frequency spectrum (col. 1 ln. 67 – col. 2 ln. 3). The impedance of a circuit is

dependent upon operating frequency. One skilled in the art will recognize that the coupler configurations disclosed in *Wuidart* cannot be utilized at UHF frequencies at all because the inductance and capacitance of antenna elements that combine to form the characteristic impedance of the device will become unrealistically small and practically unrealizable because the required dimensions would be too small and the required interconnections of the components would themselves introduce conflicting inductance and/or capacitance.

9. R1 as shown in each of the *Wuidart* circuits is either a Thevinized equivalent for the circuit DC resistance or a resistor placed in parallel with the inductors. When connected in this way, R1 does not change the circuit resonance, but merely reduces the antenna bandwidth/selectivity/tunability or "Q" via simple damping. Resistance R1 is not an element of any of *Wuidart*'s claims. This is a further indication that R1 is not an essential element of the invention.
10. Resistance R1 is critical to a UHF coupler according to the invention. The fact that R1, coupled between ground and the microstrip line(s), is different from the characteristic impedance of the line creates a mismatch which causes (L1,C1) through (Ln,Cn) to form a standing wave along the microstrip line that only simulates an equal to R1 impedance at the UHF operational frequency. A wave impedance above the transmission line at operational frequency becomes almost equal to transponder impedance thus maintaining an impedance match, an optimum coupling with it and, in turn, an energy transfer to a transponder accordingly rather than all the terminal output energy simply being absorbed by R1, as occurs in *Wuidart*.
11. The coupler disclosed in *Wuidart* is a parallel resonant circuit used as a load for an amplifier as a feedback. The *Wuidart* coupler forms a magnetic field and is intended to work with magnetically coupled devices -- transponders which also have inductor(s) tuned at resonance and sensitive practically only to magnetic field. Our invention is a UHF band-pass filter in the form of a microstrip transmission line with distributed parameters. A UHF transponder, which is a dipole in nature, has high characteristic impedance in Near Field and is most sensitive to an electric component of the wave. This electromagnetic wave that is propagating along the line has its characteristic impedance dependent on frequency, which makes the system frequency selective.
12. The coupler disclosed in *Wuidart* cannot have a spatial selectivity -- a property to enable a communication only with one, targeted transponder surrounded by others. Instead, *Wuidart* teaches to organize an array of cells to cover as big an interrogation area as possible. In contrast, our solution is aimed at enlargement of an interrogation zone but still only for one transponder in presence of adjacent transponders, to achieve high spatial selectivity.

Boris Y. Teirlin
Boris Teirlin

Sworn and subscribed before me this
the 2nd day of August, 2006

Judith I. Rothstein
Notary Public

My Commission expires: 6/10/07

